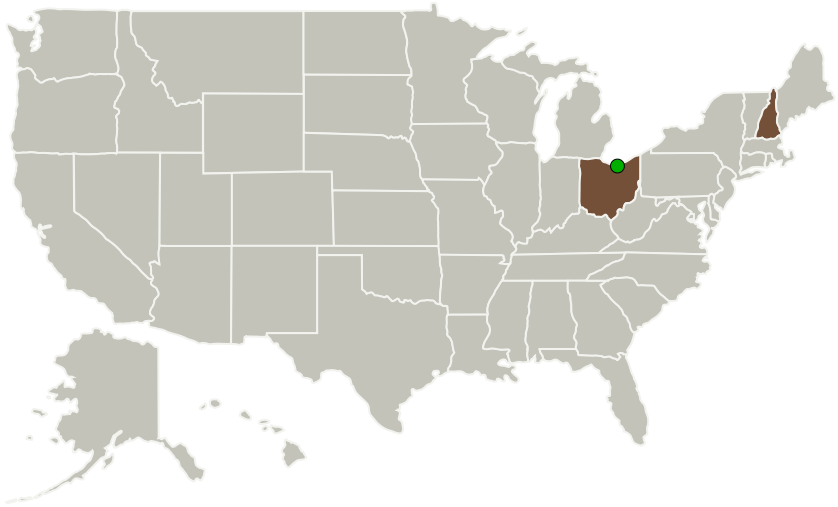
A Two-Phase Cooling Loop for Fission Surface Power Waste Heat Transport, Phase I

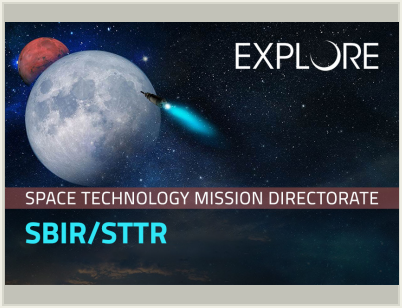
Completed Technology Project (2010 - 2010)

Project Introduction

Current lunar-based Fission Surface Power (FSP) Systems that will support sustained surface outposts consist of a nuclear reactor with power converters, whose waste heat is transported to radiator panels to be rejected to the environment. The current approach is to transport waste heat using a heavy, pressurized water cooling loop. For each 20 kW of heat rejection, the current water cooling loop components weigh approximately 52 kg due to the large flow rate of water, the large pressure drop, and the pump and other components. Our innovation is a novel Waste Heat Transport System (WHTS) that combines Creare's lightweight radiator technology with a Lightweight Cooling Loop (LCL). Using our approach, we estimate that our LCL will reduce the cooling loop system mass by 60% compared to the current approach. Our approach will have a reduced system pressure, resulting in decreased plumbing size and weight, and eliminate the need for a mechanical pump, increasing system reliability. During the Phase I project, we will establish the feasibility of our innovative, Lightweight Cooling Loop (LCL) by fabricating a fully operational, subscale prototype and testing it under prototypical conditions. During the Phase II project, we will design, fabricate, and deliver to NASA a prototype LCL for integration with our ultra-light radiator.

Primary U.S. Work Locations and Key Partners





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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
New Hampshire	Ohio

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138765)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Creare LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

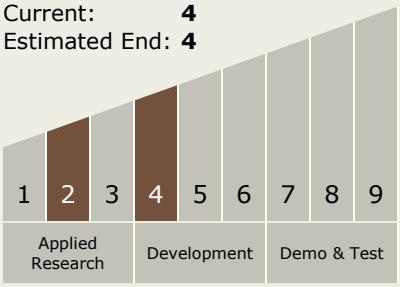
Carlos Torrez

Principal Investigator:

Jay C Rozzi

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System